In situ autogenous reconstruction of the thoracoabdominal aorta and branches for treatment of an infected thoracoabdominal aortobifemoral bypass graft

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Graft infection is an uncommon but potentially lethal complication of prosthetic aortic repair. We describe a novel technique for upper abdominal aortic and visceral revascularization after percutaneous drainage and antibiotics failed to cure a thoracofemoral prosthetic graft infection. One week after axillofemoral and femorofemoral bypass grafting, the infected thoracoabdominal graft was removed and a bifurcated iliac artery autograft was used to replace the upper abdominal aorta and revascularize the abdominal viscera. The infected graft was removed from the thorax and retroperitoneum, the infection resolved, and the patient remained well until his death of lung cancer 9 years later. (J Vasc Surg 1998;27:977-80.)

Graft infection is an uncommon but potentially life-threatening complication after prosthetic aortic repair.[1] Conservative temporizing measures include antibiotic treatment and percutaneous drainage. Definitive (curative) treatment requires removal of the infected graft material and revascularization of the lower extremities. This has been accomplished by a variety of surgical approaches, including extraanatomic bypass and graft excision, in situ replacement with aortic allografts, autogenous veins or arteries, or antibiotic-coated synthetic prostheses.[2-6] When the infected prosthetic aortic graft involves the thoracoabdominal aorta, including its visceral and renal branches, it is essential to preserve blood flow to the visceral vascular beds as well as the lower extremities. In this report, we describe a novel technique for replacing an infected thoracoabdominal aortobifemoral bypass graft, in which the lower extremities are supplied by extraanatomic bypass grafting and the upper aorta and visceral arteries are replaced with a common iliac artery autograft, including its internal and external branches.

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CASE REPORT

A 73-year-old man was referred with a chronically infected thoracoabdominal aortic bifemoral bypass graft 2½ years after grafting at another institution. Originally, *Escherichia coli* bacteremia had developed in the patient after a prostate biopsy, and 4 months later he returned with hematochezia. This was caused by a primary aortoenteric fistula complicating a type IV thoracoabdominal aortic aneurysm. A thoracoabdominal aortobifemoral bypass procedure was performed with end-to-side anastomosis of the proximal graft to the distal thoracic aorta and separate synthetic grafts from the aortic graft to the celiac, superior mesenteric, and left renal arteries. The right kidney could not be revascularized. One year later a left flank abscess developed that required drainage, debridement, and intravenous antibiotics. Drainage persisted, and the flank wound dehisced. Repeated courses of intravenous antibiotics and continuous catheter drainage were unsuccessful.

Sixteen months after the graft infection was first diagnosed, the patient was referred to our institution for surgical management. A preoperative computed tomographic scan performed after contrast injection into the sinus tract showed an irregular abscess cavity in the left posterior pararenal space surrounding the aortic graft from immediately below the diaphragm to the left sacroiliac joint. An aortogram showed the graft and all of its branches to be widely patent, along with aortoiliac disease bilat-

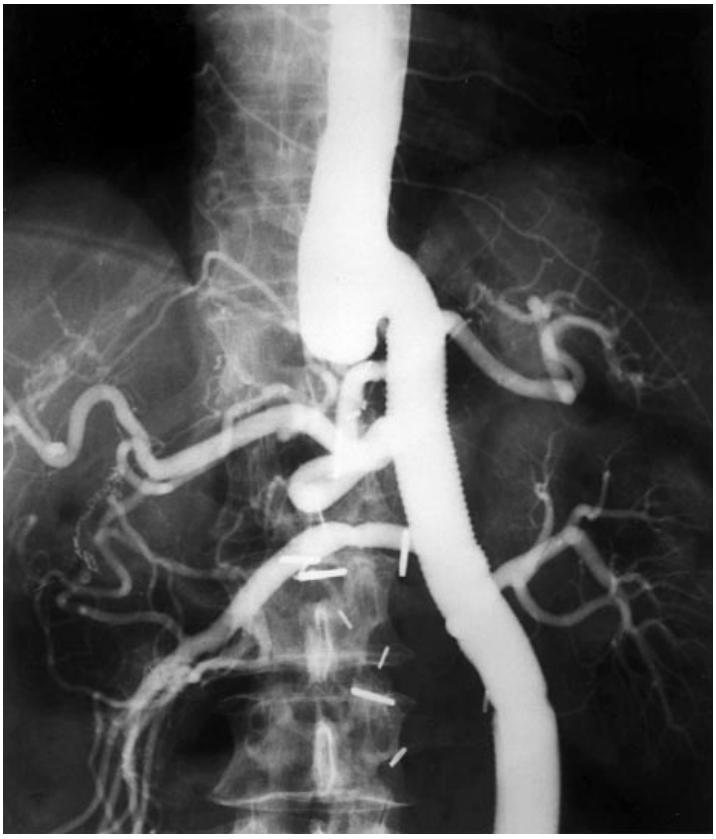

Fig. 1. Preoperative descending aortic angiogram shows the prior aortic bypass graft arising from the leftward aspect of the lower thoracic descending aorta. Note the absence of right renal revascularization.

erally (Fig. 1). Ankle-brachial indexes were 0.43 on the left and 0.44 on the right.

The surgical revision was performed in two stages. Lower extremity revascularization was achieved with right axillofemoral and femorofemoral bypass grafting into the same areas as the thoracofemoral graft limbs. The procedure was uncomplicated and resulted in improvement of the ankle-brachial indexes to 0.47 on the left and 0.60 on the right. Seven days later the abdomen was entered through a full-length midline incision. The colon, spleen, pancreas, and stomach were detached along the left peritoneal reflection, mobilized, and retracted using medial visceral rotation. The right common iliac artery was mobilized, including the bifurcation branches. The common iliac artery, most of the internal iliac artery, and the proximal 12 cm of the external iliac artery were harvested. To restore full patency to the mildly diseased iliac branches, semiclosed eversion endarterectomy was performed, and they were then stored in saline solution for later use.

The distal thoracic aorta was mobilized through a transcrural approach to the level of the end-to-side aortic graft anastomosis. The graft appeared to be well incorporated at this level, and there was no evidence of infection. The celiac, superior mesenteric, and left renal arteries were all mobilized from the levels of the prosthetic grafts proximally to their first branches distally. An aortic clamp was placed across the stump at an oblique angle, allowing flow through the graft but excluding the stump. The stump was divided transversely, and the cul de sac thrombus was removed, producing a widely patent stump. The common iliac segment of the bifurcated autograft was anastomosed end-to-end to the distal thoracic aorta with continuous 4-0 polypropylene suture. The internal iliac artery was positioned to the left and slightly posterior, and the external iliac arm was positioned to the right and slightly anterior. The branches of the celiac trunk were controlled with vascular clamps, and the celiac artery was divided just beyond its attachment to the graft, which was temporarily oversewn. After dilatation of the distal celiac artery and removal of a redundant length of external iliac artery from the autograft, the external iliac branch of the autograft was sewn end-to-end to the distal celiac artery using 5-0 polypropylene suture. The clamps were removed from the celiac branches and flow was restored after 25 minutes of ischemia. The superior mesenteric artery was then transected distal to its graft anastomosis, and the graft was lig-

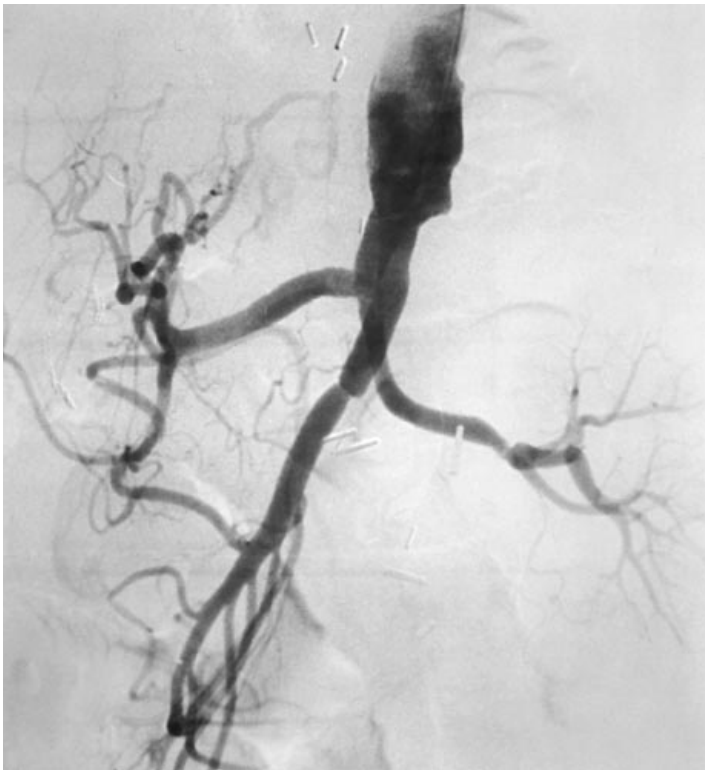

Fig. 2. Postoperative angiogram shows the prior graft to be removed and successful revascularization of the viscera with the iliac autograft.

ated. The superior mesenteric artery was attached end-to-end to the internal iliac branch of the autograft with continuous 5-0 polypropylene suture, and visceral flow was restored after a 15-minute ischemic time. The splenic artery was divided approximately 8 cm from its origin for revascularization of the left renal artery. The left renal artery was then transected, and the prosthetic graft was ligated. The distal renal artery was gently dilated and anastomosed end-to-end to the transected splenic artery using 5-0 polypropylene suture. Blood flow to the kidney was restored after 23 minutes. Strong pulsations were palpated beyond each of the visceral anastomoses, and resumption of urine flow was prompt.

The proximal prosthetic graft was mobilized and its anastomosis to the thoracic aorta exposed and isolated using a side-biting clamp. The entire graft and its suture material were removed, and the anastomotic defect in the thoracic aorta was patched with a free segment of the external iliac artery autograft, which restored a normal contour to the distal thoracic aorta. The iliac limbs of the prosthetic graft were mobilized and removed completely from the abscess using gentle traction. The abdominal viscera were returned to the normal position, thereby covering the reconstruction. Because of ischemia of the spleen, splenectomy was performed before closure of the wound.

The patient was continued on vancomycin and cefotaxime after the operation. Pseudomonas pneumonia developed and was successfully treated. Postoperative aortography performed 1 week after surgery showed a patent autogenous reconstruction, with good flow to the celiac, superior mesenteric, and left renal arteries (Fig. 2). The patient experienced no signs or symptoms of residual infection, and was discharged home on the tenth postoperative day. He was continued on cephalexin, and drainage of the original abscess was continued for 2 months. The patient experienced no further infectious complications and died of metastatic lung cancer 9.5 years later.

DISCUSSION

Prosthetic graft infection, which occurs in approximately 1% to 2% of patients who undergo prosthetic aortic reconstruction, can be a devastating complication.[1] Surgical treatment of infected aortic grafts has been accomplished using a variety of strategies, including graft excision with either extraanatomic bypass grafting or in situ graft replacement.[2-6] Although the infection rate for thoracoabdominal grafts is similar to that for aortic aneurysm grafts in general,[7] the surgical management of the former group may be substantially more

complex. Among 13 patients in Crawford's series who had an infected thoracoabdominal graft more than 30 days after the initial repair, 11 died as a result of the infection, which illustrates the dire consequences of this complication.[7]

After Wylie's introduction of arterial autograft for vascular replacement,[8] we reported on the use of autogenous tissue for lower extremity revascularization after graft infection[5] and on the benefits of staged revascularization with extraanatomic bypass grafting after aortofemoral graft infection.[2] In the present case, we used both of these strategies to treat a thoracoabdominal graft infection that was refractory to more conservative therapies.[9] One week after extraanatomic revascularization of the lower extremities, the common iliac artery and its bifurcation branches were endarterectomized and used to replace the upper abdominal aorta and the visceral and renal branches. This allowed removal of the entire infected thoracoabdominal graft from the retroperitoneum and thorax. The infection resolved, and the autograft repair was durable for the remaining 9 years of the patient's life. It is worth noting that splenectomy was required as a result of ischemia. This development was not unexpected, given that splenectomy is required in 30% to 50% of patients in whom the splenic artery is used for renal arterial revascularization (splenorenal bypass grafting).

In addition to providing a novel technique for reconstruction of the upper abdominal aorta and its branches, this case clearly illustrates the versatility of autogenous vessels for complex revascularization associated with treatment of prosthetic graft infection, as has previously been reported.[4,5] There are an abundance of potential arterial sources for autografting, and it would be unlikely that one could not retrieve a satisfactory arterial segment for autograft reconstruction. In the event that arterial autograft is not an option, we would resort to autogenous deep vein, which has demonstrated satisfactory performance for aortic reconstruction.[4]

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